ZIBELINE INTERNATIONAL™ PUBLISHING

ISSN: 2785-9002 (Online)
CODEN: FAERCS

Food and Agri Economics Review (FAER)

DOI: http://doi.org/10.26480/faer.02.2021.107.120

RESEARCH ARTICLE

AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF MAJOR VEGETABLES IN PARSA DISTRICT, NEPAL

Amrita Paudel*, Anish Paudel, Rishi Ram Kattel

Agriculture and Forestry University Nepal
Corresponding Author Email: pdlamr1998@gmail.com

ARTICLE DETAILS

Article History:

Received 05 June 2021
Accepted 07 July 2021
Available online 12 July 2021

ABSTRACT

The survey research was conducted to analyze the economics of production and marketing of major vegetables in Parsa district of Nepal from December 2019 to April 2020. Primary data for the household survey were collected using a semi-structured questionnaire from sixty sampled respondents, sixteen from Pokhariya municipality, and forty-four from Bahudarmai municipality. Secondary data were collected through scientific journals, articles, and publications from agricultural organizations, projects, and programs. Average area under vegetable cultivation was found 12.68 Kattha. Out of five major vegetables under study average cost of production per kattha was found highest for pointed gourd (Rs. 11551.50) lowest for okra production (Rs. 6071/kata). The majority of production cost was covered by labor cost (>40%). The average productivity of cauliflower, okra,brinjal, chilli, and pointed gourd was 27.3 Mt/ha,19 Mt/ha,16.67 Mt/ha, 27.52Mt/ha, and 25.83Mt/ha respectively. B:C ratio of all the vegetables under study was higher than three which implies that vegetable farming in the study area is profitable farm business. Producers-wholesalers-retailers-consumers was the most used marketing channel. Market margin of cauliflower, okra, brinjal, chilli and pointed gourd was Rs. 13/kg, Rs. 7.73/kg, Rs. 7.86/kg, Rs. 28.07/kg and Rs. 8.69/kg respectively. Index of severity was constructed to rank the problems in the production and marketing of vegetables. Analysis of the problems identified shows the need for proper storage facilities, training related to vegetable farming and insect pest management, and subsidies on regular basis, and mechanization and modernization of the farming system through the introduction of technological knowledge and modern farm practice.

KEYWORDS

Vegetable production; Productivity; Profitable; Market margin; Marketing channel

1. INTRODUCTION

Agriculture is the mainstay of the Nepalese economy providing employment opportunities to around two-thirds of the country's population and contributing 27.10% to the national GDP (WIKIPEDIA, 2020a; MOAD, 2019). To uplift the country's economy by increasing agricultural production and productivity, various laws, plan, and policies have identified the vegetable sub-sector as one of the leading sectors (Pokhrel, 2010). Vegetable farming has not only been identified as the backbone of Nepalese agriculture but is also the major livelihood option for rural poor farmers contributing around 9.71% to total Agricultural GDP (Karki, 2015).

Vegetable production and marketing is gradually emerging as an important sub-sector with a remarkable contribution to the nation's economy in Nepal (Pokhrel, 2010). During the last 10 years from 2009/2010 to 2018/2019, the area under vegetable crops has increased by about 26% and production has been increased by about 42% (MoAD, 2019). In terms of export, vegetable is the fifth important agricultural commodity after lentil, cardamom, wheat, and tea (CBS, 2013). But still, the amount of vegetable that is exported is way lesser than the amount imported in Nepal. In 2017/18, Nepal imported edible vegetables and certain roots and tubers, and planting materials worth RS. 23729.25 million and exported them worth RS. 1,139.87 million with a trade balance of RS. -22,589.39 million(Nepal Foreign Trade Statistics, 2018). This data shows that there is a huge scope of increasing export and decreasing the import of vegetables by maximizing production within the country. The demand for vegetables is also increasing day by day due to the raised income of the people shifting their food habit from cereal towards more fruits and vegetable consumption (Ghimire et al., 2018).

Vegetable growers of Parsa district are growing 30 different kinds of vegetable, however, PMAMP, PIU, Vegetable-zone, Parsa has targeted mainly on 21 species of vegetable namely Pea, Broad bean, Coriander, Cauliflower, Onion, Chilly, Garlic, Okra, Brinjal, Cabbage, Bitter gourd, Pointed gourd, Radish, Broad leaf mustard, Bottle gourd, Sponge gourd, Cowpea, Potato, Tomato, Pumpkins and Cucumber (PMAMP, 2018a). Based on the area, production, and productivity Cauliflower, Cowpea, Chilly, Brinjal, and Okra are five major vegetables grown in the Parsa district (PMAMP, 2018a). In Parsa, there is 9,082 ha of land area covered by vegetables with a production of 154034 mt and productivity of 16.96 mt/ha (MOAD, 2019).

Quick Response Code	Access this article online	
	Website: www.faer.com.my	DOI: 10.26480/faer.02.2021.107.120

Cite The Article: Amrita Paudel, Anish Paudel, Rishi Ram Kattel (2021). An Economic Analysis of Production and Marketing of Major Vegetables in Parsa District, Nepal. *Food and Agri Economics Review, 1(2): 107-120.*

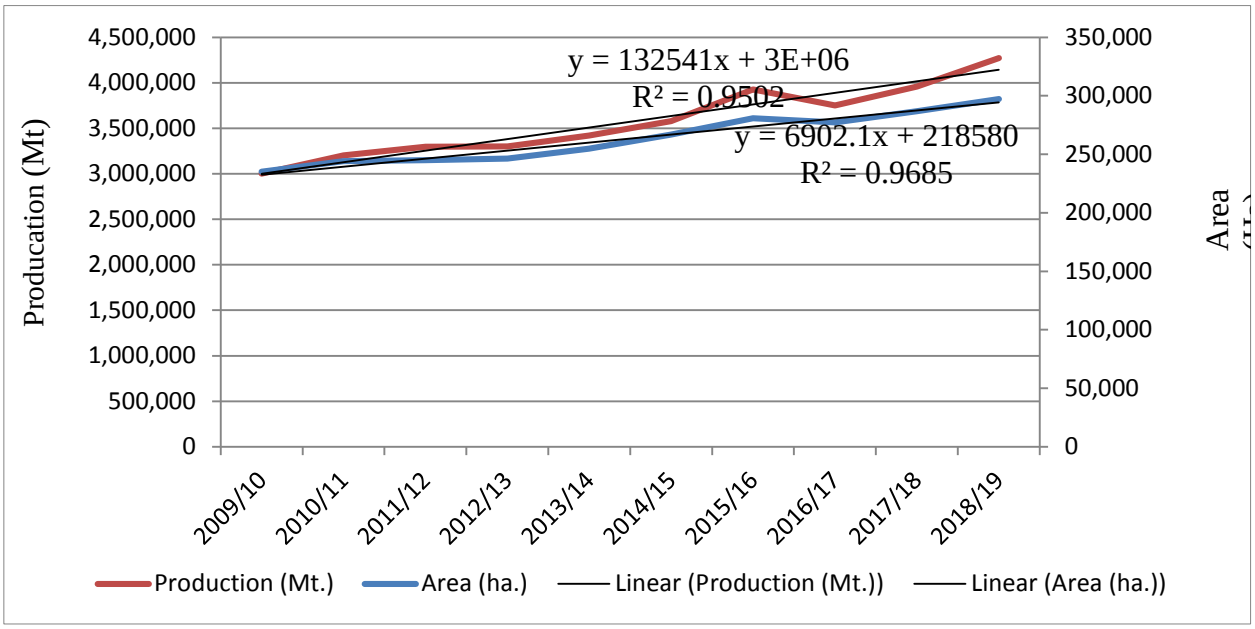

Figure 1: Trend analysis of area production of vegetables in Nepal (2008/09-2018/19)

Source: MOAD (2019)

Table 1: Area, production, and productivity of major vegetables in Parsa

S.N.	Commodity	Area (ha.)	Production (Mt)	Yield (Mt/ha)
1	Cauliflower	850	15,661	18.42
2	Chilli	226	4,585	20.28
3	Okra	312	3,595	11.54
4	Brinjal	211	4758	22.55
5	Pointed Gourd	300	5279	17.6

Source: MOAD (2019)

According to nutritionists, the minimum per capita requirement of vegetables in the diet is 300 gm (USAID, 2011). But the vegetable intake by Nepalese is very low with a deficiency of about 60% compared to this standard. Nutritionists suggest eating at least 5 servings of different varieties of fruits and vegetables every day. As awareness among people regarding a balanced diet is increasing, the demand for vegetables is also increasing day by day. Vegetable has now become an integral part of a balanced diet and people have started realizing its importance in maintaining nutritional security.

Nepal is enriched with a wide range of agro-ecological variations which creates comparative advantages for the production and marketing of different vegetables in Nepal. Such variation makes it possible to grow various seasonal and off-season vegetables throughout the country which ultimately offers extreme benefits in the context of diet, nutrition, employment, and the nation's economy. In Nepal, Vegetable production in Terai, Mid-hill, and High hills were recorded 55%, 40%, and 5% respectively (MOAC, 2009). In terms of area and production, cauliflower is the most cultivated vegetable crop in Nepal followed by cabbage. Due to higher and earlier returns even at low investment, the area and production of vegetable farming is increasing in Nepal.

The efficient utilization of limited land and other resources for increasing the production and productivity of vegetables is of utmost importance (Ghimire, Lamsal, Paudel, & Khatri, 2018). Lack of sufficient research in the field of production and marketing of vegetables has limited the scope of development of the vegetable sector (Ghimire et al., 2018). Systematic research and analysis of production, marketing of vegetables, and pattern of growth of vegetable sector is necessary for identifying the constraint and opportunities in vegetable sub-sector. Moreover, such observations and research help government agencies to formulate suitable plans and policies for promoting the overall development of this sub-sector.

1.2 Statement of the problem

Insufficient studies and research on the production and marketing of vegetable farming have narrowed down the development of the vegetable sector (Ghimire et al., 2018). Unavailability of quality inputs and improved varieties, insufficient modern farm equipment and technical knowledge, fluctuation in market price, and insufficient access to market information are some major problems in vegetable farming in Nepal (Paudel, 2019). Post-harvest loss of vegetables is also higher in Nepal which lies in the range of 20-50% (Devkota, Dhakal, Gautam, & Dutt, 2014). On the marketing side, poor market access, low price of outputs, lack of storage facility, lack of draft power, poor transportation, and inadequate government support for price determination, poor availability of price information to farmers compared to traders contribute to market imperfectness (Sharma, 2019). Production related problems such as diseases and pests' severities, unavailability of good quality seed and fertilizer in the input market hinder vegetable farmers from realizing optimum crop productivity (Sharma, 2019).

1.3 Rationale of the study

The development and growth of vegetable sub-sector can be one of the most important strategies to maintain trade balance in Nepal. Increased production of vegetables is not just important, but it must be produced efficiently with special attention on cost reduction and profit maximization. Another important factor for the overall growth of vegetable sub-sector is marketing. Produced commodities should be marketed successfully through proper marketing channels and at a fair price.

A study of the economics of vegetable production and marketing system helps to understand the process involved in the production and transfer of farm products from producers to consumers along with the costs, returns, and profitability from these activities. In addition to this, identification of constraints in production and marketing of vegetables helps policymakers to formulate favorable policies for the overall growth and development of the vegetable sub-sector.

1.4 Objectives

The broad objective of this study was to analyze the economics of production and marketing of major vegetables in the Parsa district.

Specific objectives were as follows:

1. To analyze the cost, return, and profitability of major vegetables in the study area.
2. To assess the marketing system, marketing channel, market access, and market situation of major vegetables in the study area.
3. To examine marketing margin and producer's share of major vegetables in the study area.
4. To identify the major constraints in the production and marketing of major vegetables.

1.5 Scope and limitation of the study

The study was carried out in Bahudarmai and Pokhariya municipality of Parsa, which is under the command area of PMAMP, PIU, Zone-Vegetable,

Parsa. So, the data represents the costs, return, profitability, market details, and various constraints of production and marketing of major vegetables which helps to develop effective strategies and increase the productivity of vegetables and the economic status of farmers. Identification of constraints in vegetable production and marketing helps to formulate appropriate coping strategies and further recommends for policymakers to give due attention to this sector and enhance the livelihood of concerned farmers and stakeholders.

Although having a broad and highly ambitious expectation, research has some limitations in design and implementation, this study may not cover the overall economics of production and marketing scenario of the whole country. Since data will be collected from the municipalities within the command area of Vegetable Zone where most of the people are engaged in commercial vegetable farming it may not be sufficient to draw inference for the economics of production and marketing for the whole Parsa district. Inadequate time due to the outbreak of the COVID-19 pandemic, non-response cooperation from farmers, stakeholders, and line agencies, political instability were some constraints to conduct its plans and programs efficiently.

2. Research Methodology

2.1 Study Site

The study was carried out in Bahudarmai and Pokhariya Municipality of Parsa District where Vegetable Zone, Parsa has been implemented. The district lies mostly in Terai and partly in the Chure area with an elevation of 122 to 925 meters above mean sea level (WIKIPEDIA, 2020b). It lies at a latitude and longitude of 27° to 27.26° N and 84° to 84.27°E. The district belongs to the tropical region with an average rainfall of 1760.6 mm (WIKIPEDIA, 2020b). The total area under cultivation is around 54,406 ha which is 72% of its total area with 26060 ha of land having a good irrigation facility (PMAMP, 2018a).

2.2 Sample and sampling technique

Out of 664 total vegetable growers (sampling frame), 60 vegetable growers were selected using a simple random sampling method.

2.3 Research instruments

The semi-structured interview schedule was prepared in the English language and questions were asked in the Nepali language. The interview questions were prepared following the specific objectives of the study. The closed and open-ended pre-tested interview schedule was used to collect data through a household survey. Rapid market appraisal (RMA) survey was conducted with vegetable collectors, wholesalers, retailers in major market hubs of the vegetable zone in the Parsa district. About 15 traders samples were taken using a checklist in the study area.

2.4 Data and data types

The primary data were collected from the local leaders, officers of zone office, AKC and vegetable growers of the study area. Primary data was collected from the vegetable growers by using semi-structured questionnaires. For collecting marketing-related information such as the market price of vegetable commodity rapid market appraisal was carried out in the local market. A detailed review of available literature such as; various research papers, scientific journals, government reports on the project's progress reports was done to gather the information related to the research topic.

2.5 Data analysis techniques

Raw data obtained from the field was arranged, analyzed, and interpreted to obtain a certain conclusion. Data collected were coded, entered, tabulated, and analyzed by using various data analysis software. In this study, collected data was analyzed by using SPSS (Statistical Package for Social Science) and Microsoft Excel.

2.5.1 Economic analysis

This section includes the analysis of production cost, B:C ratio, gross return, net return, market margin, and producer's share of consumer's rupee.

a. Total cost of production

It is the total cost involved in the production of certain output or product (Samuelson & Nordhaus, 2010) and is calculated as:

$$TC = FC + VC$$

Where TC = Total cost

FC = Fix cost

VC = Variable cost

Fix cost indicates the summation of the cost incurred in all fixed items and variable cost means the summation of the cost incurred in all the variable items.

b. Gross Return

It is the total revenue obtained by selling the produced item (Samuelson & Nordhaus, 2010) which is calculated as follows:

$$GR = Q * P$$

Where GR= Gross Revenue

Q= Total quantity of product marketed

P= Per unit price of the product

c. Net Return

Net return is the profit obtained i.e. the difference between gross return and cost of production which is calculated as:

$$NR = GR - TC$$

Where NR= Net return

GR= Gross return

TC= Total cost of production

d. Benefit-cost (B: C) analysis

The benefit-cost analysis will be done after the calculation of the total variables cost and gross return from the vegetable cultivation. It is calculated as;

B/C ratio = gross return/ total variable cost

Where Gross return can be calculated as;

Gross return=Total quantity (Kg)*Price per Kg (Rs)

e. Marketing Margin

Marketing Margin (MM) is the difference between the price paid by the consumers and the price received by the farmers and will be calculated by subtracting farm-gate prices from retailer prices (Shrestha , 2012).

MM = Retailer Price – Farm gate Price

f. Producer's share

Producers' share is the price received by the farmer expressed as a percentage of the retail price, that is, the price paid by the consumers (FAO). It can be calculated by the following formula.

$$PS = (Pf/Pr) \times 100$$

Where, Pf = Producer's price (farm gate price)

Pr = Retailer's price

Ps = Producer's share

g. Marketing channel

The marketing channel was drawn based on the information obtained from the producer level to the consumer level. All linkage and coordination among all levels i.e. input supplier, grower, collector, retailer, and final consumer were analyzed for the marketing channel.

2.5.2 Problems in production and marketing

The index was prepared mainly taking into account the qualitative data. Based on responded frequencies, weighted indexes were calculated for the analysis of farmer's perception of the extent of production and marketing problems of vegetable producers. Farmer's perception to the different production and marketing problems was ranked by using a five-point scale of problems compromising very important, highly important,

normally important, less important, and least important by giving weightage on the basis of priority i.e. 5 for first priority, 4 for second, 3 for third, 2 for fourth and 1 for fifth priority. Then the priority index for each variable was calculated by weightage average mean in order to draw a valid conclusion and making a reasonable decision. The index of importance was computed by using the formula (Timilsina & Shivakoti, 2018):

$$Iimp = \sum$$

Where,

Iimp = index of importance

$\sum$ = summation

Si = Ith scale value

Fi = Frequency of ith importance given by the respondents

N = total number of respondents

2.5.3 SWOT analysis

SWOT analysis is the scan of the internal and external environment and is a powerful tool in value chain analysis of agricultural products (Galea & Bonnici, 2015). The strength, weaknesses, opportunities, and threats related to vegetable subsectors were analyzed from field and market through observation, interview, and discussion with concerned stakeholders.

3. Results and Discussion

This section includes the results obtained through the analysis of the data obtained through interview schedule, formal and informal discussion sessions, rapid market survey, and various secondary sources throughout the survey period.

3.1 Socio-economic characteristics of respondents

3.1.1 Age of respondents

Out of 60 respondents selected for an interview, respondents of age group 35-45 are highest in Frequency i.e.21(35%) and respondents of age group 0-25 are lowest in Frequency i.e. 2 (3.3%).

Table 2: Age of respondents

Age-group	Frequency (n=60)	Percentage
<25	2	3.33
25-35	13	21.67
35-45	21	35.00
45-55	16	26.67
55-65	6	10.00
65>	2	3.33
Total	60	100.00

Source: Field Survey, 2020

3.1.2 Gender of respondents

Figure 2 reveals that among 60 respondents selected for the interview schedule 91.67% (55) of respondents were male whereas 8.33% (5) were female in the study area (Figure 2). This indicates a higher involvement of male respondents in providing the information.

3.1.1 Education status of respondents

The education level of respondents was categorized into five categories viz. illiterate, literate, basic level, secondary level/+2 and bachelors, and above. The category illiterate means the ones who cannot read and write, literate is the term used to denote people who can read and write but have not acquired formal education, basic level means that have passed SLC/SEE, secondary level indicates completion of class 12 and bachelors and above indicates undergraduate and above the undergraduate level of education.

Table 3: Age of respondents

Age-group	Frequency (n=60)	Percentage
<25	2	3.33
25-35	13	21.67
35-45	21	35.00
45-55	16	26.67
55-65	6	10.00
65>	2	3.33
Total	60	100.00

Source: Field Survey, 2020

Table 3 given above shows that out of 60 respondents selected for the interview schedule, the majority of the respondents were literate 70% (42) who can easily read and write. Only 5% (3) respondents were illiterate. This data shows that the literacy rate of the correspondents is high which suggests that modern technology can be introduced in the study area and there is the scope of mechanization and dissemination of scientific knowledge, skill, and techniques required in vegetable farming through meetings, seminar and in written forms such as booklets, leaflets, posters, etc. as well.

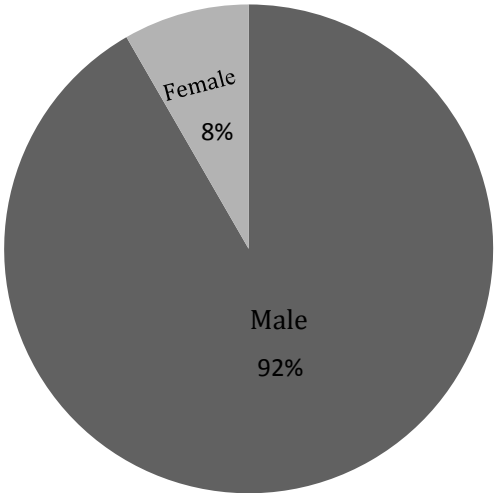

Figure 2: Gender of respondents
Source: Field Survey, 2020

3.1.3 Ethnicity and Religion of respondent

Parsa district lies in the Terai region which is dominated by the Madhesi community. The ethnic groups in the study area were categorized into three categories viz. Dalits, Madhesi, and Muslims. Among them, most of the respondents i.e 91.67% (55) were found to be Madhesi, and the remaining 8.33% (5) were Dalits and Muslims.

In the study area, 95% (57) of the respondents were Hindu whereas the remaining 5% (3) of the respondents were Muslim.

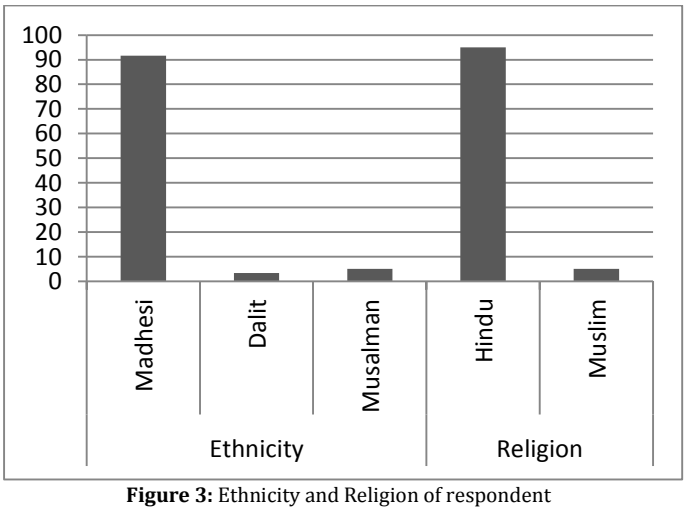

Figure 3: Ethnicity and Religion of respondent

3.1.4 Type of family of respondent

The family type of the majority of the respondents was found to be a joint family. 40% (24) respondents were found to be living in the nucleus family.

Table 4: Family type of respondents

Type of family of Family type		Frequency (n=60)	Percentage
Valid	Nucleus	24	40.00
	Joint	36	60.00
	Total	60	100.00

Source: Field Survey, 2020

3.1.5 Family size of respondents

The table below shows that majority (45%) of the respondent was found to have a family size of 5-8 followed by a family size of 9-12 (30%). Only 8 and 7 of the 60 respondents were found to have a family size of above 12 and up to 4, respectively. The mean family size in the study area was 8 (SD=4) with a minimum family size of 2 and a maximum of 18 members. As most of the respondents were living in a joint family, the family size was found to be larger in the study area. According to the National Population census 2011, the average family size of households in Parsa district was 6.29, and the majority of the household was found to have a family size of 5 (CBS, 2012) which is lower than the average family size of the study area. As most of the families in the study area were joint families (Table 5), the average family size was found to be higher in the study.

Table 5: Family size of respondents

Family size	Frequency (n=60)	Percentage
Up to 4	7	11.67
5-8	27	45.00
9-12	18	30.00
Above 12	8	13.33
Total	60	100.00

Source: Field Survey, 2020

3.1.6 Distribution of economically active population

Economically active population indicates the population having age from 15 to 59 years. The age of the family members of selected respondents was categorized into below 15, 15-59, and above 59. The majority of the people from the family of selected respondents were found to be economically active population and only a few i.e. 5.4% (27) were found to be older than 59 years of age. Out of the total population of family members of respondents, 58.25% (293) people were found to be directly involved in agricultural activities. Economically active population in the study area was found to be higher than that of the central Terai region which is 54.73% (CBS, 2012).

Table 5: Distribution of the economically active population

Age group	Frequency (n=60)	Percentage
<15	183	36.38
15-59	293	58.25
>59	27	5.36
Total	503	100.00

Source: Field Survey, 2020

3.1.7 Source of household income

Majority of the sampled respondents (91.67%) reported agriculture as their main source of income followed by service (5%) and business (3.33%). This data shows that agriculture is the major occupation and main source of income in the study area.

Table 7: Source of household income of respondents

Source	Frequency (n=60)	Percentage
Agriculture	55	91.67
Service	3	5.00
Business	2	3.33
Total	60	100.00

Source: Field Survey, 2020

3.1.8 Annual household income

The annual income of households is categorized as low (>Rs.120000), medium (Rs.120000-440000), and high (>Rs.440000). The majority of the respondents (48.33%) were found to have a medium annual household income that is Rs.120000-440000. About 26.67% (16) respondents reported having low annual household income and 25% (15) were found to have a high income. The average household income of sampled respondents was Rs. 331666 and average farm income from vegetable cultivation was Rs. 229583 (69.22% of average annual income).

Table 6: Annual household income

Income category	Frequency (n=60)	Percentage
Low	16	26.67
Medium	29	48.33
High	15	25.00
Total	60	100.00

Source: Field Survey, 2020

3.1.9 Food sufficiency level from own production

Out of 60 sampled respondents, 63.3% (38) respondents reported having food sufficiency level more than 12 months from their production. This means they produce more food than they required for home consumption. 33.3% (20) respondents produce food that fulfills their food requirement of 6-12 months. Only 3.3% (2) respondents reported having food sufficiency for 3-6 months.

Table 7: Food sufficiency level from own production

Food sufficiency (month from own production)		Frequency (n=60)	Percentage
Valid	3-6 months	2	3.33
	6-12 months	20	33.33
	>12 Months	38	63.33
	Total	60	100.00

Source: Field Survey, 2020

3.1.10 Land ownership and distribution

Table 10 shows that the average landholding of the respondents was 28.98 Kattha (SD=21.37) and average cultivated land is 29.63 Kattha (SD=18.77). Here average of own land is less than average cultivated land because some farmers have taken land in a lease for the cultivation of vegetables as well as for food crops. The average irrigated land (25.16 Kattha) was higher than the average unirrigated land (3.82 Kattha). The average land cultivated with the vegetable crop was 12.68 Kattha which is about 43% of total cultivated land in the study area. The table also shows that around 87% of the land area of total landholdings was found to have irrigation facilities.

Table 8: Land ownership and distribution

Details of land	Mean	Std. Deviation	Minimum	Maximum
Own land (in Kattha)	28.98	21.37	2.00	100.00
Cultivated land (Kattha)	29.63	18.77	1.50	100.00
Irrigated land (in Kattha)	25.16	18.02	0.00	100.00
Unirrigated land (in Kattha)	3.82	6.25	0.00	25.00
Land cultivated with vegetables	12.68	7.69	1.00	30.00

Source: Field Survey, 2020

3.1.11 *Category of farmers according to the land area cultivated with vegetables*

According to guidelines provided by PMAMP, in terai region farmers having 10 Kattha of land cultivated with vegetables are considered commercial farmers (PMAMP, 2016). Based on the area cultivated with vegetables, farmers were categorized as semi-commercial and small farmers.

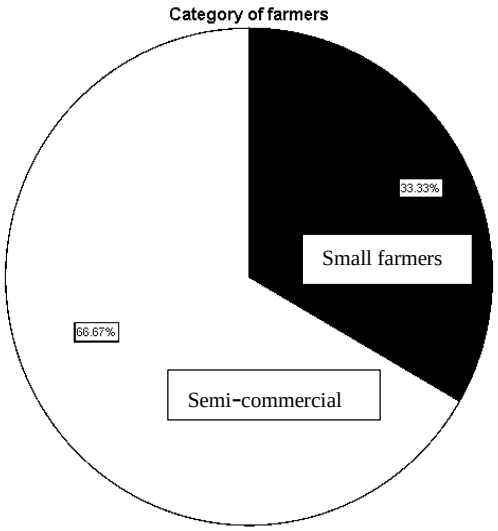

Figure 4: Category of farmers based on area cultivated with vegetable

Figure 4 shows that out of 60 sampled respondents, 66.67% (40) were semi-commercial farmers i.e. having 10 Kattha of land cultivated with vegetables, and the remaining 33.33% (20) were small farmers with less than 10 Kattha of land area cultivated with vegetables.

3.2 Inputs and services

3.2.1 *Source of irrigation*

Vegetable growers in the study area were found to use the canal, tube well, and boring-pump set as sources of irrigation. Around 87% of the land was found to have irrigation facilities in the study area (table 11). Most of the land area was found to be irrigated by bore well/pump set which is 73.83% of total irrigated land, followed by the canal (25.66%).

Table 9: Source of irrigation

Source	Percentage of land irrigated
Area irrigated by canal	25.66
Area under tube well-irrigated land	0.51
Area under boring/pump set irrigated land	73.83

Source: Field Survey, 2020

3.2.2 *Rental value of land, wage rate, tractor rent*

Table 12 shows that the average rent of land in the study area was Rs.3833/Kattha per year. The average wage rate of the male was found to be Rs.504 whereas that of females was Rs.270. The wage rate of the male in the study area was much higher than of female. The average per hour rent of tractor in the study area was Rs.1153.

Table 10: Rental value of land, wage rate, tractor rent

	Mean	Std. Deviation	Minimum	Maximum
Rental value of land (Rs/Kattha per year)	3833	1710	1000	8000
Wage rate of male (Rs/Day)	504	55	175	650
Wage rate of female (Rs/Day)	270	192	150	1500
Rent rate per hour of tractor (Rs/Hour)	1153	169	700	1400

Source: Field Survey, 2020

3.2.3 *Situation of labor availability*

Labor availability situation in the study area was categorized into 3 categories viz. easy, difficult, and managed by home labor. Out of 60 sampled respondents, 65% (39) respondents reported easy labor availability whereas 28.33% (17) respondents were not getting labor easily at the time of requirement. And few of them were managing the farm work by home labor. Migration of working manpower to other parts of the country for better job opportunities, migration to the foreign country, and the unwillingness of youth to be involved in the field works were the major reasons for the labor shortage in the area as reported by the respondent. Also, the low wage rate for the workers is the reason for the difficulty in labor availability in the study area.

Table 11: Situation of labor availability

Availability of labor when required	Frequency (n=60)	Percentage
Easy	39	65.00
Difficult	17	28.33
Managed by home labor	4	6.67
Total	60	100.00

Source: Field Survey, 2020

3.2.4 *Services from service providers*

Table 14 shows that 60 selected respondents were taking services from various service providing organizations. In the study area, many organizations were working as the service providers to the vegetable growers, which were: AKC, Municipality, Co-operatives, Agro-vets, NGO/INGOs, and Vegetable zone. PMAMP, PIU, Zone-vegetable, Parsa was providing various services such as training and subsidies to the majority of the respondents followed by various NGO/INGOs operating in the study area which were providing services to 21.67% (13) respondents. 18.33% (11) respondents were getting services from all the service providing organizations/agencies. Similarly, 16.67% (10) respondents were getting services from AKC, Parsa. The municipality office of Pokhariya and Bahudarmai, Local co-operatives, and Agro-vets were also providing various training and advisory help to the vegetable growers of the area. These organizations were helping vegetable growers by providing market information, loans, subsidies on small agri-tools and machinery, and training on vegetable farming.

Table 12: Service providing organizations

Service providers	Frequency (n=60)	Percentage
AKC	10	16.67
Municipality	2	3.33
Co-operatives	3	5.00
Agro-vets	2	3.33
NGO/INGO	13	21.67
Vegetable zone	19	31.67
All	11	18.33
Total	60	100.00

Source: Field Survey, 2020

3.2.5 Decision on the type of vegetables to grow

Table 15 below shows that out of 60 sampled respondents, 35% (21) were consulting with neighbors to decide the type of vegetables to grow. 33.33% (20) were deciding the type of vegetable to grow based on market information and price of vegetables at the market and 31.67% (19) were deciding based on last year's price of the corresponding vegetable.

Table 13: Factors affecting decision on type of vegetables to grow

	Frequency (n=60)	Percentage
Market information	20	33.33
Last year price	19	31.67
Consultation with neighbors	21	35.0
Total	60	100.00

Source: Field Survey, 2020

3.2.6 Source of market information

Sources of market information used by vegetable growers of the study area were assessed. The majority (48.33%) of respondents were getting market information by direct market visit. 23.33% (14) respondents were obtaining it through cross-checking with producers and the same Percentage of respondents were obtaining it from friends and neighbors. Few of them were using mass media and all the above-mentioned sources for getting market information.

Table 14: Source of market information

Source	Frequency (n=60)	Percentage
Direct market visit	29	48.33
Cross-check with other producers	14	23.33
From friends/neighbors	14	23.33
Mass media/TV/radio	1	1.67
All	2	3.33
Total	60	100.00

Source: Field Survey, 2020

3.3 Economics of production and marketing of major vegetables

Economic analysis of production and marketing was done for cauliflower, okra, brinjal, chilli, and pointed gourd which are the most commonly cultivated vegetables in the study area. Economics of production and marketing includes calculation of the total cost of production, the quantity of vegetables produced, cost per quintal, gross income, net profit, and benefit-cost ratio.

3.3.1 Cost of production

Cost of production of vegetables includes labor cost (land preparation cost, planting/transplantation cost, cost of intercultural operation and harvesting cost), machine costs (tractor/power tiller and pump set), and input cost (cost of seeds, fertilizers, pesticides, and other supplements).

Information on the cost of human labor, tractor/power tiller, pump set use, seed, manures, fertilizers, plant protection chemicals, and land rent for five major vegetables were obtained from 60 sampled respondents and the total cost of production was calculated.

Table 17: Cost of production of major vegetables in Parsa (Rs/Kattha)

Cost	Cauliflower	Okra	Brinjal	Chilli	Pointed gourd
	Average cost	Average cost	Average cost	Average cost	Average Cost
	Rs/Kattha	Rs/Kattha	Rs/Kattha	Rs/Kattha	Rs/Kattha
1. Human Labor	3909.78 (48.26)	3150.00 (51.89)	3364.17 (44.06)	3776.67 (54.23)	6592.13 (57.07)
2. Tractor/Power Tiller Use	407.27 (5.03)	500 (8.24)	370.50 (4.85)	104.00 (1.49)	916.67 (7.94)
3. Pump set Use	199.10 (2.46)	133.30 (2.20)	149.16 (1.95)	105.60 (1.52)	231.50 (2.00)
4. Sprayer Use	89.44 (1.10)	66.67 (1.10)	156.25 (2.05)	11.15 (0.16)	625.00 (5.41)
5. Seed	940.00 (7.90)	110.00 (1.81)	560.00 (7.33)	800.00 (11.49)	58.33 (0.50)
6. Manure	1125.00 (13.89)	1000.00 (16.47)	1851.73 (24.25)	1589.50 (22.82)	1142.80 (9.89)
7. Fertilizer	648.58 (8.01)	888.89 (14.64)	794.09 (10.40)	380.23 (5.46)	677.90 (5.87)
Plant Protection Chemical	1015.50 (12.54)	222.22 (3.67)	388.89 (5.09)	78.33 (1.12)	342.59 (2.97)
Land Lease	131.20 (1.62)	131.20 (2.12)	131.20 (1.72)	131.20 (1.88)	131.20 (1.14)
Other Costs(Soil amendments and staking)	66.67 (0.82)	0.00 (0.00)	0.00 (0.00)	118.73 (1.70)	833.33 (7.21)
Total	8101.29 (100)	6071.07 (100)	7634.79 (100)	6964.21 (100)	11551.50 (100)

Note: Figures in parentheses indicate percentage to total
Source: Field Survey, 2020

Table 17 above shows the average cost of production (Rs./Kattha) of five major vegetables in the Parsa district.

- Cauliflower

Cauliflower is one of the major vegetables in the Parsa district. From the study, the average total variable cost of production of cauliflower was found to be Rs. 8101.29 per Kattha in which human labor contributes the highest cost that is 48.26% followed by manures (13.89%) and plant protection chemicals (12.54%). In a similar study conducted by (Katovich & Sharma, 2014) in the Bardiya district, per Kattha cost of cauliflower cultivation was found to be Rs. 6000 and in another study conducted by (Patel, Thakar, Soumya, & Modi, 2018) in India, it was found to be Rs. 3795.73 which is lower than the findings of this study during the survey period. The cost of plant protection chemicals which includes pesticides and insecticides is higher in the case of cauliflower than in other crops because vegetable growers in the area were facing a high incidence of cabbage butterfly and aphid.

- Okra

The average total cost of production of okra was found to be Rs. 6071.07 per Kattha where the cost of human labor was highest which contributed 51.89% of the average variable cost of production of okra. In a similar study conducted in Uttar Pradesh, India by (Sing & KrishnaKant, 2018), the cost of production of okra per Kattha was found to be Rs. 3663.36 which is much less than the average production cost in the study area. Since, cost of inputs such as seeds, fertilizers, pesticides, etc. is higher in Nepal than in India cost of production was found to be higher in the study area as compared to the study conducted in India.

- Brinjal

The average total cost of production of brinjal was Rs. 7634.79 per Kattha where human labor costs the highest among all the other inputs contributing 44.06% of average variable cost. According to the study conducted by (Patel, Thakar, Soumya, & Modi, 2018) in India, the cost of production of brinjal was Rs3438.35/ Kattha which is much lower than that in the study area during the study period. The higher cost of agricultural inputs may be the reason for the higher production cost of vegetables in Nepal as compared to that in India.

- Chilli

The average total cost of production of chilli was Rs. 6964.21 per Kattha. In this case, also the cost of human labor is the highest which 54.23% of the average variable cost is. Farmers in the study area were cultivating chilli not only for green chilli production but also for seed production.

- Pointed gourd

Pointed gourd is one of the most popular and most cultivated vegetables in the study area. Since it is a perennial vegetable crop, it gives maximum production for at least 3-4 years. The average cost for pointed gourd production in the study area was found to be Rs. 11551.50 per Kattha. Cost of human labor was highest that is 57.07% of the total cost for pointed gourd production followed by the cost of manures (9.89%).

Table 18 shows that the labor cost contributes more than 40% of the total cost of production in the case of all five vegetables followed by the cost of fertilizers and manure and plant protection chemicals in the case of cauliflower. Thus, it is justified that vegetable cultivation is a labor-intensive job with a major portion of the cost involved being occupied by labor cost.

3.3.2 Production and cost of production per kg of vegetables

People in the study area are engaged in vegetable farming all round a year producing various seasonal and off-season vegetables. Table 18 shows the production (kg/Kattha) and the cost of production per kg (Rs. /kg) of five major vegetables in the study area.

Table 18: Average production (kg/Kattha) and cost of production per kg of vegetables

S.N.		Vegetables production (kg/Kattha)				
		Cauliflower	Okra	Brinjal	Chilli	Pointed gourd
1	Production (kg/Kattha)	910.00	633.33	555.56	917.33	861.11
2	Cost per kg(Rs.)	7.23	9.59	13.74	7.59	13.41

Source: Field Survey, 2020

- Cauliflower

In the study area, cauliflower is mostly cultivated during post summer and winter seasons. Average productivity of cauliflower in the study area was found to be 910 kg/Kattha (27.3 Mt/ha) which is higher than the average productivity of cauliflower in Parsa district (18.42 Mt/ha). The cost of production per Kg of cauliflower in the study area was found to be Rs. 7.23.

- Okra

Okra is mostly cultivated in the summer season in the study area. Average productivity of okra in the study area was found to be 633.33 kg/Kattha (19 Mt/ha) which is higher than the average productivity of okra in the Parsa district (11.54 Mt/ha). The cost of production per kg of okra in the study area was found to be Rs. 9.59.

- Brinjal

Average productivity of brinjal in the study area was found to be 555.56 Kg/Kattha (16.67 Mt/Ha) which is lower than the average productivity of brinjal in Parsa district (22.55 Mt/ha). The lower productivity of brinjal in the study area was reported to be caused by a higher incidence of brinjal fruit and shoot borer and bacterial wilt of brinjal. The cost of production per Kg of brinjal in the study area was found to be Rs. 13.74.

- Chilli

Average productivity of chilli in the study area was found to be 917.33 kg/Kattha (27.52 Mt/Ha) which is higher than the average productivity of chilli in Parsa district (20.28 Mt/ha). The cost of production per kg was found to be Rs. 7.59.

- Pointed gourd

Pointed gourd is one of the most preferred vegetables by the respondents in the study area because of lower production cost and its perennial nature which gives maximum production for at least 4-5 years after planting. Farmers were using cuttings from their farms as propagating material of pointed gourd. Average productivity of pointed gourd in the study area was found to be 861.11 kg/Kattha (25.83 Mt/ha) which is higher than the average productivity of pointed gourd in Parsa district (17.60 Mt/ha). The cost of production per kg of pointed gourd was found to be Rs.13.41.

Productivity of the vegetables in the study area was found higher because most of the respondents in the study area were using high-yielding varieties from Indian market and also more than 60% of growers were involved in commercial vegetable farming.

3.3.3 Average price and gross return

Table 19 shows the average selling price and gross return of vegetables in the study area. Average selling price of pointed gourd was found to be the highest among all five vegetables under study which is Rs. 55.75 per kg followed by that of okra (48. Rs/Kg). The selling price of brinjal, cauliflower, and chilli was found to be Rs47.00, Rs41.33and Rs34.00 per kg respectively.

The study shows that gross return from pointed gourd was highest (Rs. 48006/Kattha) followed by cauliflower cultivation (Rs. 37610/Kattha). Gross return from brinjal was lowest (Rs. 26111/Kattha).

Table 19: Average selling price and gross return of vegetables

S.N.	Vegetables	Production kg/kattha	Average price Rs/kg	Gross return Rs/kattha
1	Cauliflower	910.00	41.33	37610.00
2	Okra	633.33	48.00	30400.00
3	Brinjal	555.56	47.00	26111.12
4	Chilli	917.33	34.00	31189.33
5	Pointed gourd	861.11	55.75	48006.94

Source: Field Survey, 2020

3.3.4 Benefit-cost ratio of major vegetables

Benefit-cost analysis can be done after the calculation of the total variable cost and gross return from the vegetable cultivation. It is calculated as;

B/C ratio = gross return/ total variable cost

According to Bhandari, Bhattrai, and Aryal (2015) vegetables have a benefit-cost ratio from 1 to 3 in Nepal. Compared to the findings of Bhandari et al. (2015), Benefit-cost ratio of vegetables under study was found to be higher than benefit-cost ratio obtained in their study.

Among the five major vegetables under study, Benefit-cost ratio of okra was found to be the highest (5.01) followed by cauliflower (4.64). As B:C

ratio of all five major vegetables was found to be more than 2, it is justified that the cultivation of these vegetables in the study area is economically feasible.

Table 20: Benefit-cost ratio of vegetable

S. N.	Vegetable	Total variable cost Rs/Kattha	Gross return Rs/Kattha	B:C ratio
1	Cauliflower	8101.29	33477.30	4.64
2	Okra	6071.07	30400.00	5.01
3	Brinjal	7634.79	26111.12	3.42
4	Chilli	6964.21	31189.33	4.48
5	Pointed gourd	11551.50	48006.94	4.16

Source: Field Survey, 2020

3.3.5 *Marketing channels of vegetables*

Four different marketing channels were used by the respondents for selling their vegetable produces.

- Channel 1: Producer-Consumer
- Channel 2: Producer-Retailer-Consumer
- Channel 3: Producer-Wholesaler-Retailer-Consumer
- Channel 4: Producer-Collector-Wholesaler-Retailer-Consumer

The figure given below represents the Percentage of vegetables sold through four different marketing channels used in the study area. Channel 3 was found to be used most through which 57.42% vegetable produces were found to be sold followed by channel 2 through which 29.92% of the vegetable produces were being sold. 11.50% of the vegetable produces were being sold through channel 1. Channel 4 was the least used channel with only 1.17% of the vegetable produces being sold through this channel.

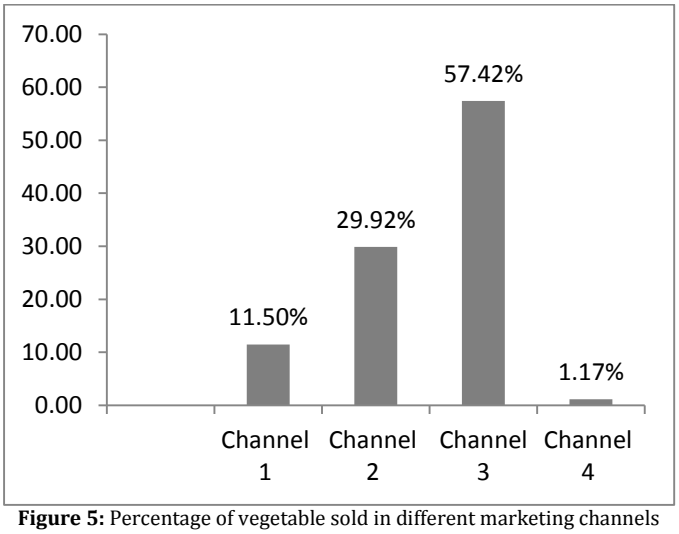

Figure 5: Percentage of vegetable sold in different marketing channels
Source: Field Survey, 2020

3.3.6 *Market margin and producer's share in the study area*

Efficiency of the marketing system can be evaluated by the marketing margin and producer share. Lower marketing margin and higher producer share on retail prices indicate an efficient market system. The table below shows that for all the vegetables under study, the producer's share was more than 50%.

Table 21: Market margin and producer's share of vegetables in the study area

S.N	Vegetable	Farmgate price (Pf)	Retailer's price (Pr)	Market margin (Mm)	Producer's share(Ps)
1	Cauliflower	41.33	54.33	13	76.07
2	Okra	48.00	55.73	7.73	86.13
3	Brinjal	47.00	54.86	7.86	85.67
4	Chilli	34.00	62.07	28.07	54.78
5	Pointed gourd	55.75	64.44	8.69	86.51

Source: Field Survey, 2020

3.4 Market access and potential market situation of vegetable

Most of the vegetables produced in the study area were being sold to the local market and district market. But the vegetable produces produced in the study area have a good potential to be exported to distant national markets as well as to the neighboring country that is India.

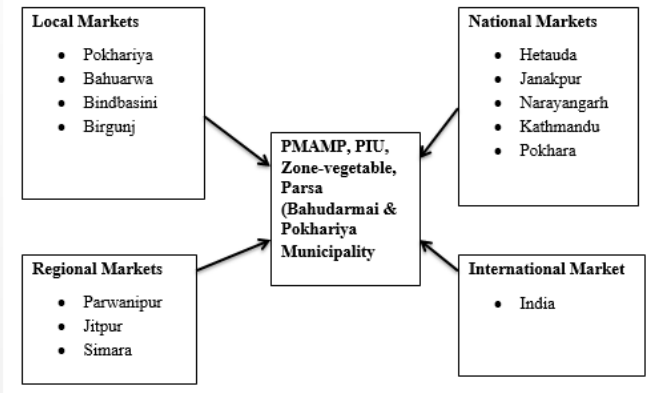

Figure 6: Potential markets for the vegetables produced in the study area
Source: Field Survey, 2020

3.5 Life insurance and crop insurance

Life insurance and crop insurance were not done by any of the respondents till the survey period. Respondents were a bit aware of crop insurance but they were not much known about the procedure and advantages of crop insurance. But farmers showed their willingness to know more about it. This shows that there is a scope of extending information on crop insurance to the farmers in the study area which will provide some economic security and compensation to the farmers from complete crop loss.

3.6 Record keeping

Among 60 selected respondents, 83.33% (50) respondents were not keeping a record of production cost and return from vegetable farming. Only 16.67% (10) respondents were maintaining a record of the costs incurred and returns from vegetable farming. They were maintaining a record in written form. Since the majority of respondents were not aware of record keeping they were not known about the actual cost, amount of production, and returns from vegetable farming (Table 1)

Table 22: Record keeping on production cost and return from vegetable farming

Record keeping	Frequency (n=60)	Percentage
No	50	83.33
Yes	10	16.67
Total	60	100.00

Source: Field Survey, 2020

3.7 Post-harvest handling of vegetables

Post-harvest handling includes activities like cleaning, grading, sorting, and packing/packaging.

3.7.1 *Grading of vegetables*

According to the table given below, the grading of the vegetables was done by the majority of respondents. Only 10% (6) respondents were not doing grading before selling their products.

Table 15: Grading of vegetables		
Grading	Frequency (n=60)	Percentage
No	6	10
Yes	54	90
Total	60	100.00

Source: Field Survey, 2020

Out of 54 respondents doing grading of the products before selling, 50% (30) were grading the vegetables by discarding damaged ones and sorting them according to their size. 36.67% (22) respondents were discarding damaged ones only before selling and only a few (3.33%) were doing grading of the vegetables on the basis of size and color.

Table 16: Type of grading		
Type of Grading	Frequency (n=60)	Percentage
Discarding damaged ones only	22	36.67
Discarding damaged ones and graded on size	30	50.00
Discarding damaged ones and graded on size and color	2	3.33

Source: Field Survey, 2020

3.7.2 Packaging and Transportation

Most common packaging materials used by the vegetable producers in the study area were bamboo basket, plastic bags (big polythene bags), crates, and jute sacks. The table below shows that the majority of respondents were using jute or plastic sacks for packaging cauliflower, okra, brinjal, and pointed gourd, and for chilli majority were using crates as a packaging material.

Table 17: Packaging materials used for vegetables					
		Packaging materials			
		Bamboo basket	Plastic bag	Crate	Sacs(jute /plastic)
S.N	Vegetables	Percentage	Percentage	Percentage	Percentage
1	Cauliflower	15(9)	36.67(22)	0.00(0)	48.44(29)
2	Okra	33.33(20)	0.00(0)	11.67(7)	55(33)
3	Brinjal	18.33(11)	3.33(2)	5(3)	73.33(44)
4	Chilli	5(3)	13.33(8)	65(39)	16.67(10)
5	Pointed gourd	5(3)	1.67(1)	40(24)	53.33(32)

Note: Figures in parentheses indicates Frequency (n=60)
Source: Field Survey, 2020

Table 26 shows that 90% of the respondents were selling their vegetable products from the farm gate. Collectors, retailers, and wholesalers from the local market of the study area as well as from outside of the district were reported to visit the farmer's field to buy vegetables directly from the farmers. As the study area is located near the Indian border, Indian vegetable traders were also coming into the study area and buying vegetables directly from the farmer's field. Only 10% of respondents were selling farm products at the local market. They were using local buses and auto-rickshaw for transporting vegetables to local markets.

Table 18: Main market outlet for vegetables in the study area		
Main market outlet	Frequency (n=60)	Percentage
Farm gate	54	90.00
Local market	6	10.00
Total	60	100.00

Source: Field Survey, 2020

3.8 Farmer's perception on price range, satisfaction, and major players for price determination

3.8.1 Agreement before selling

Majority of respondents (93.33%) were not doing agreement before selling the vegetables. Only 6.67% (4) respondents were reported to have done an agreement before selling (Table 27). The verbal agreement was done by the respondent and the written agreement of vegetables was not reported during the survey period in the study area.

Table 19: Agreement before selling		
Agreement before selling	Frequency (n=60)	Percentage
No	56	93.33
Yes	4	6.67
Total	60	100.00

Source: Field Survey, 2020

3.8.2 Level of satisfaction from price of vegetables

Table 28 shows the level of satisfaction to the farmers from the price received by selling vegetables. Level of satisfaction to the respondents from the price received was categorized into five levels as not satisfied, low satisfaction, moderate satisfaction, high satisfaction, and very high satisfaction From, the price received by selling cauliflower majority of respondent were highly satisfied and 30% of respondents were reported to be moderately satisfied. The majority of the respondents were reported to be moderately satisfied with the price of okra, brinjal, and chilli. The majority of respondents were very highly satisfied with the price received by selling pointed gourd. Very few respondents were reported to be unsatisfied with the price received from vegetables.

Table 20: Level of satisfaction to the farmers from price of vegetables

Vegetable	N	Not – Satisfied	Low Satisfaction	Moderate satisfaction	High Satisfaction	Very high Satisfaction
Cauliflower	60	3.33% (2)	10.00%(6)	30.00%(18)	40.00%(24)	16.67%(10)
Okra	60	1.67%(1)	5.00%(3)	86.67%(52)	6.67%(4)	0.00%(0)
Brinjal	60	1.67%(1)	5.00%(3)	68.33%(41)	23.33%(14)	1.67%(1)
Chilli	58	1.75%(1)	3.51%(3)	59.65%(34)	26.32%(15)	8.77%(5)
Pointed gourd	54	1.85%(1)	0.00%(0)	0.00%(0)	38.89%(21)	59.26%(32)

Note: Figures in parentheses indicate frequency
Source: Field Survey, 2020

3.8.3 Factors governing the price of produced vegetables

Various factors that govern the price of produced vegetables in the study area were identified through field visits and FGD with vegetable growers in the study area. Five factors were stated in the interview schedule and respondents were asked to rank the factors according to their perception and experience. Scaling technique was used to rank the factors from most influencing to least influencing on the five-point ranking scale. In the study area availability of vegetables in the market with an index of 0.68 was the most important factor followed by the availability of market information. Bargaining power was the least important factor governing the price of produced vegetables with an index of 0.49.

Table 21: Factors governing the price of produced vegetables

Factors	Index	Rank
Availability of vegetables in market	0.68	I
Market information	0.67	II
Season of harvest	0.57	III
Transport system	0.55	IV
Bargaining power	0.49	V

Source: Field Survey, 2020

3.8.4 Players determining the price of vegetables

Players determining the price of vegetables in the study area were ranked on a 5-point scale from most dominating to least dominating. In the study area, wholesalers were found to be the most dominant players in determining the price of vegetables followed by producers. The least dominating players were co-operatives with an index of 0.31.

Table 22: Players determining the price of vegetables

Players	Index	Rank
Wholesalers	0.80	I
Producers	0.65	II
Local collectors	0.62	III
Retailers	0.62	III
Co-operatives	0.31	IV

Source: Field Survey, 2020

3.9 Details on the vegetable market, marketing, trader's perception on vegetable business trend

This includes various marketing activities such as vegetable marketing and trading system, price fixation in vegetable markets in the study area, trader's perception on the trend of vegetable business, demand and supply scenario of vegetables, vegetable storage facilities, and post-harvest losses of vegetables. To obtain the information on vegetable markets and marketing systems in the study area, a rapid market survey was done in Birgunj which is the main market of the vegetables produced in the study area.

3.9.1 Business type

Table 31 shows the business type of vegetable sellers in the study area. 66.67% of them were retailers and the remaining 33.33% were wholesalers.

Table 23: Type of business of sellers

Business type	Frequency (n=60)	Percentage
Wholesaler	5	33.33
Retailer	10	66.67
Total	15	100.00

Source: Field Survey, 2020

3.9.2 Source to purchase vegetables

Data from the table below shows that around 40% of sellers were buying vegetables from farmers from their field directly (farm gate), the next 40% were buying from wholesalers, and the remaining 20% were purchasing vegetables for selling from local collectors (Table 32).

Table 24: Source to purchase vegetable

Source of vegetables	Frequency (n=60)	Percentage
Farmers	6	40.00
Collectors	3	20.00
Wholesalers	6	40.00
Total	15	100.00

Source: Field Survey, 2020

3.9.3 Trader's perception about changing trend of vegetable marketing

The perception of local vegetable traders about the changing trend of vegetable marketing was assessed. Data shows that the majority of respondents reported an increasing trend of vegetable marketing over the last five years. They reported that there is increased awareness regarding the role of vegetables in a balanced diet leading to the increased consumption of vegetables and more people are being involved in vegetable production and marketing, vegetable production and marketing is in increasing trend.

Table 33: Trader's perception about changing trend of vegetable marketing

Trend	Frequency (n=60)	Percentage
Increasing	12	80.00
Decreasing	2	13.33
Same	1	6.67
Total	15	100.00

Source: Field Survey, 2020

3.9.4 Method of payment for vegetables

All of the respondent traders were paying cash on delivery. No respondent was reported to be paying for vegetables in advance. Agreement before buying was not reported in the study area during the survey period.

3.9.5 Vegetable trading association

No vegetable trading association was operating in the Birgunj vegetable

market though there were more than 100 vegetable traders selling vegetables in the market during the survey period.

3.9.6 Factors considered by traders in setting buying price of vegetables

Four major factors considered by traders in setting the buying and selling price of vegetables were identified through interaction and discussion with local traders. Ranking of the factors from most important to least important was done by using the scaling technique. The quality of the vegetable was found to be the most important factor with the index followed by the quantity of vegetables purchased.

Table 25: Factors considered by traders in setting purchasing and selling price of vegetables

Factors	Index	Rank
Quality	0.95	I
Purchase quantity	0.70	II
Demand force	0.50	III
Supply force	0.35	IV

Source: Field Survey, 2020

3.9.7 Post-harvest management of vegetables by traders

All of the 15 selected traders were keeping vegetables in an open condition. There was no provision of cold storage or any other kind of storage to prevent decay and deterioration of vegetables. Lack of storage facility for vegetables has led to high post-harvest loss resulting in lower profit margin to the traders in the study area.

3.10 Problems in vegetable production and marketing

3.10.1 Factors influencing vegetable cultivation

Factors influencing vegetable cultivation and production in the study area were identified and ranked on a 5-point scale through the scaling technique. The market price was found to be the major factor influencing vegetable cultivation followed by land suitability. Prior knowledge of vegetable production and marketing and good return was 3rd and 4th major factors where neighbor's influence was the minor factor (Table 35).

Table 26: Factors influencing vegetable cultivation

Factors	Index	Rank
Market price	0.74	I
Land suitability	0.70	II
Prior knowledge	0.68	III
Good return	0.54	IV
Neighbor's influence	0.35	V

Source: Field Survey, 2020

3.10.2 Problems in vegetable production

Different problems are faced by the producer during the production of vegetables in the study area. Five major problems were identified during the field visit and FGD with local vegetable growers. Those problems were stated in the interview schedule and respondents were asked to rank the problems according to their perception. Scaling techniques are applied to find out the seriousness of the production problems.

Table 27: Problems in vegetable production

Production problems	Index	Rank
Lack of quality seeds	0.82	I
Lack of technical knowledge on vegetable farming	0.73	II
Attack of pest	0.55	III
Lack of farm labor	0.52	IV
Poor rainfall	0.39	V

Source: Field Survey, 2020

3.10.3 Problems faced by the producers in marketing of produced vegetables

There are several problems in the marketing of produced vegetables in the study area. Five major problems in the marketing of vegetables in the study area were identified through discussion with local vegetable growers. The seriousness of the problems was determined and the rank was assigned to the problems by using scaling techniques (Table 37).

Table 28: Problems faced by producers in marketing of vegetables

Marketing problem	Index	Rank
Lack of marketing knowledge	0.71	I
Seasonal price fluctuation	0.69	II
Dominance of Indian market	0.65	III
More gap between farm gate and retail price	0.60	IV
Distance to market	0.38	V

3.10.4 Problems faced by traders in marketing of vegetables

Problems faced by traders in the marketing of vegetables were identified through discussion with local traders and were ranked on a scale of 1-4. Faster decay of vegetables followed by lack of storage facilities and followed by poor quality vegetables ranked as the most serious, 2nd most serious, and 3rd most serious problem with an index of 0.97, 0.95 and 0.93, respectively. Irregular supply of vegetables was not much serious problem and ranked as the least serious problem with an index of 0.45.

Table 38: Problems faced by traders in marketing of vegetables

Problems	Index	Rank
Faster decay of vegetables	0.97	I
No storage facility	0.95	II
Poor quality of product	0.93	III
Irregular supply	0.45	IV

Source: Field Survey, 2020

3.11 SWOT analysis of vegetable production and marketing in study area

Strengths	Weakness
Access to the road, market, and access to the inputs Long tradition of vegetable production and marketing as a source of income Increasing local and regional markets with improving marketing facilities Cultivation being done by forming farmers group and firm Proximity to one of the largest marketing hub, Birgunj Technical knowledge, training, and subsidies are being provided to the farmers by PMAMP, PIU, vegetable zone, Parsa	Lack of proper irrigation facility and inefficiency of existing irrigation system Lack of appropriate crop varieties and quality seed supply Excessive use of chemical fertilizers and pesticides Lack of technical services and improved cultivation practices Lack of well-organized collection center and storage infrastructures Lack of vegetable trader's association Limited service from local traders Excessive involvement of middleman

Opportunities	Threats
Suitable diversified climate for vegetable cultivation	Highly fluctuating market prices
Relatively good price available to the farmers	Youth migration leading to a labor shortage
Linkage to the national grid of the vegetable market	High incidence of disease and pests, requiring high use of unregistered pesticides leading to high production cost and health hazard
Suitable climatic condition for vegetable cultivation	Supply of cheaper vegetables from outside the country due to open border
Scope of organic farming	Seasonality of production
Increasing demand for vegetables	Dominance of Indian market
Increasing affordability of local people for vegetables	Damage of vegetables due to wind, hailstones, and other climatic hazards

4. Conclusion

Agro-ecological characteristics in Parsa district provide ample scope for vegetable production. Well-established road networks ensure easy transportation and market access for the vegetables produced in the area. Vegetable farming is the main source of household income for the farmers in the study area where average land cultivated with vegetables was 12.68 Kattha (42.79% of total cultivated land) and the majority (66.67%) of the respondents were semi-commercial with land of more than 10 kattha culativated with vegetable. The average total cost of cultivation of cauliflower, okra, brinjal, chilli, and pointed gourd was Rs. 8101.29, Rs. 6071.07, Rs. 7634.79 Rs. 6964.21 and Rs. 11551.50, respectively. Labor cost contributed highest among other costs in the case of all five vegetables under study which justifies that vegetable farming is a labor-intensive enterprise. Various production-related problems, technical, post-harvest, and marketing problems were being faced by vegetable producers during the cultivation. Despite these problems, the average productivity of cauliflower, okra,brinjal, chilli, and pointed gourd was 27.3 Mt/ha,19 Mt/ha,16.67 Mt/ha, 27.52Mt/ha, and 25.83Mt/ha respectively that is productivity of all four vegetables (cauliflower, okra, chilli, and pointed gourd) except brinjal under study in the study area was found to be higher than that of Parsa district for the year 2018/19. Brinjal growers of the area were facing high incidence of brinjal fruit shoot borer and bacterial wilt in brinjal that may be the reason for lower productivity of brinjal in the study area. B:C ratio of cauliflower, okra, brinjal, chilli and pointed gourd was found to be 4.64, 5.01, 3.42, 4.48, and 4.16, respectively. Since the productivity and profitability of vegetables in the study area was found to be higher than that of the whole country, farming practices used in Parsa can be explored and applied in other parts of our country to increase the overall productivity and profitability. There are four marketing channels used for the marketing of vegetables in Parsa and the most (57.42%) of the vegetables produced in the study area were being sold through the channel: producer-wholesaler-retailer-consumer. Producer's share was highest in pointed gourd (86.51%) and lowest in chilli among the vegetables under study (54.78%). Since the study area is linked to the road network there is easy market access for the vegetable to many local, regional, national as well as international markets. Though most vegetable growers are willing to continue vegetable farming they are dissatisfied due to irregularity in services such as training and subsidies by service providers and various problems such as lack of price fixation, insufficient mechanization, insufficient storage facilities, and lack of technical knowledge on vegetable farming. Analysis of these problems shows the need for proper storage facilities, agricultural loans at a lower interest rate, training related to vegetable farming and insect pest management, subsidies on regular basis, and mechanization and modernization of farming system through the introduction of technological knowledge and new agricultural equipment for maintaining and further increasing the profitability of vegetable farming.

References

ADB. 2013. Preparation of Agriculture Deveopment Strategy, Final Report. Agriculture development Bank.

ADS. 2014. Agriculture Development Strategy. Ministry of Agriculture Development.

Bhandari, N., Bhattrai, D., & Aryal, M. 2015. Cost, Production And Price Spread Of Cereal Crops In Nepal:A time series analysis 2071/2072 (2014/2015). Kathmandu: Market Research and Statistics Management Program, Ministry of Agriculture Development.

Bhattarai, D. R., Subedi, G. D., Gautam, I. P., & Chauhan, S. 2017. Post harvest supply chain study of carrot in Nepal. International Journal of Horticultur, 7(26), 239-245.

Bheel, S. K., & Burark, S. 2013. Economic Appraisal of Mandarin Cultivation in Jhalawar District of Rajasthan. Annals of Arid Zone, 141-146.

CBS, 2013. National Sample Census of Agriculture 2011/12. Kathmandu.

CBS. 2012. National population and Housing Census. Central Bureau of Statistics.

CBS. 2013. National Sample Census of Agriculture 2011/12. Kathmandu.

Devkota, A., Dhakal, D., Gautam, D., & Dutt, J. 2014. Assessment Of Fruit And Vegetable Losses At Major Wholesale Markets In Nepal. International Journal of Applied Science and Biotechnology, 2(4), 559-562.

DVN, 2018. Inter Provincial Dependency for Agricultural Development. Kathmandu: Ministry of Agriculture, Land Management and Cooperative; Department of Agriculture.

FAO. (n.d.). Concept on Price Data. Food and Agriculture Organization of the United States.

Galea, D., & Bonnici, T. 2015. SWOT Analysis. Wiley encyclopedia of management.

Ghimire, D., Lamsal, G., Paudel, B., & Khatri, S. 2018. Analysis of Trend in Area, Production and Yield of Major Vegetables of Nepal. Trend in Horticulture, 1.

Gurung, B., Thapa, R., Gautam, D., Karki, K., & Regmi, P. 2016. Commercial vegetable farming: an approach for poverty reduction in Nepal. Agronomy Journal of Nepal, 4, 92-106.

Karki, Y. 2015. Nepal Portfolio Performance Review (NPPR). Kathmandu: Ministry of Agriculture Development (MoAD).

Katovich, E., & Sharma, A. 2014. Costs and Returns of Grain and Vegetable Crop Production in Nepal's Mid-Western Development Region. USAID & Winrock International.

Krishi Diary, 2015. Harihar Bhawan, Lalitpur: Ministry of Agriculture, Land Management and Co-opratives.

MOAC. 2009. Statistical Information on Nepalese Agriculture. Ministry of Agriculture and Co-operatives.

MOAD. 2017. Statistical Information on Nepalese Agriculture. Ministry of Agriculture and Livestock Development.

MOAD. 2019. Statistical Information on Nepalese Agriculture 2018/19. Ministry of Agriculture and Livestock Development.

MRSMP. 2017. Cost of production and marketing margin of cereals, vegetables and industrial crops 2073/74. Hariharbhawan, Lalitpur: Market Research and Statistics Management Program; Departmet of Agriculture.

NHRC, 2016. Health Effects of Pesticide among Vegetable Farmers and the Adaptation Level of Integrated Pest Management Program in Nepal, 2014. Kathmandu: Government of Nepal, Nepal Health Research Council.

Patel, D., Thakar, K., Soumya, C., & Modi, D. 2018. Cost Of Cultivation And Marketable Surplus Of Major Vegetables Of North Gujarat. International Journal of Agriculture Sciences.

Paudel, B., Rai, M., Nepal, P., & Rai, D. 2019. Commercial vegetable farming: Constraints and opportunities of farmers in Kirtipur, Nepal. The Geographical Journal of Nepal, 12, 108-118.

PMAMP. 2016. Commercial Agriculture Production and processing Center(Zone) Development Program Operation Procedure. Prime Minister Agriculture Modrnization Program.

PMAMP. 2018. Khumaltar, Lalitpur: Prime Minister Agriculture Modernization Project, Ministry of Agriculture and Livestockk Development.

PMAMP. 2018a. Baseline Survey Report On Vegetable Zone, Parsa. Bahuarwa Bhatta, Parsa: Prime Minister Agriculture Modernization Project, Project Implementation Unit (Zone- Vegetable).

Pokhrel, D. M. 2010. Comparison Of Farm Production And Marketing Cost And Benefit Among Selected Vegetable Pockets In Nepal. The journal of agriculture and environment.

RECPHEC. 2016. A Report on The Study of Vegetable Markets in context of Kathmandu Metropolitan City. Kathmandu: Resource Centre for Primary Health Care, Nepal.

Samuelson, P., & Nordhaus, W. 2010. Economics. New Delhi: Tata Mc Graw Hill Education Private Limited.

Sharma, M. 2019. Production Scenario and Marketing Constraints for Small Holding Vegetable Farmers: Evidence from Sindupalchowk District, Nepal. Acta Scientific Agriculture, 3(7).

Shively, G., & Thapa, G. 2016. Markets, transportation infrastructure, and food prices in Nepal. American Journal of Agricultural Economics, 99(3).

Shrestha, G., Prajapati, S., & Mahato, B. 2014. Plant diseases and their management practices in commercial organic and conventional vegetable farms in Kathmandu Valley. Nepalese Journal of Agricultural Sciences, 129-141.

Shrestha, K., Shrestha, G., & Pandey, P. R. 2014. Economic analysis of commercial organic and conventional vegetable farming in Kathmandu valley. Journal of Agriculture and Environment, 58-71.

Shrestha, R. 2012. Factors affecting price spread of rice in Nepal. The Journal of Agriculture and Environment.

Shrestha, S., Ojha, R. B., Pradhan, N. G., & Joshi, B. D. 2018. Performance of tomato with organic manures in plastic tunnel. Journal of Nepal Agricultural Research Council, 4(28), 1-6.

Sing, J., & KrishnaKant. 2018. Production of okra in Meerut district of western Uttar Pradesh. Journal of Pharmacognosy and Phytochemistry.

Subedi, M., Pandey, m., Ojha, R., & Acharya, B. 2020. Production economics and resource use efficiency of tomato underopen field condition in Kapilvastu, Nepal. Journal of Agriculture and Natural Resources.

Thapa, M., & Dhimal, S. 2017. Horticulture development in Nepal: Prospects, challenges and strategies. Universal Journal of Agricultural Research, 5(3), 177-189.

Thapa, M., & Dhimal, S. 2017. Horticulture Development in Nepal: Prospects,Challenges and Strategies. Universal Journal of agriculture Research, 177-189.

Timilsina, K., & Shivakoti, G. 2018. Vegetables production and marketing:practice and perception of vegetable seed producers and fresh growers in Nepal. Agriculture & Food Security.

TNAU. 2018. Horticulture sector. Tamilnadu University.

Tripureshwar, 2018. Nepal Foreign Trade Statistics Fiscal Year 2017/18. Kathmandu: Ministry of Finance, Department of Custom.

USAID. 2011. Value Chain/ Market Analysis Of The Off-Season Vegetable Sub-Sector In Nepal. Kathmandu : United States Agency for International Development.

WIKIPEDIA. 2020a. Economy of Nepal. Retrieved from Wikipedia, the free encyclopedia: https://en.wikipedia.org/wiki/Economy_of_Nepal

WIKIPEDIA. 2020b. Wikipedia, A free encyclopedia.

WITS. 2018. Nepal:Trade Summary. World Integrated Trade Solution.